INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior

National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)
Exp. Date (11/30/2010)
Form No. (10-226)

Reporting Year:	**Park:**	**Select the type of permit this report addresses:**
2006	Shenandoah NP	Scientific Study

Name of principal investigator or responsible official:	**Office Phone:**
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Additional investigators or key field assistants (first name, last name, office phone, office email)
No co-investigators

Project Title (maximum 300 characters):
Novel Weapons Hypothesis valid in some areas but not all

Park-assigned Study or Activity #:	**Park-assigned Permit #:**	**Permit Start Date:**	**Permit Expiration Date:**
SHEN-00330	SHEN-2006-SCI-0014	Sep 18, 2006	Dec 31, 2007

Scientific Study Starting Date:	**Estimated Scientific Study Ending Date:**
Sep 18, 2006	Dec 31, 2007

For either a Scientific Study or a Science Education Activity, the status is:	**For a Scientific Study that is completed, please check each of the following that applies:**
Continuing	__ A final report has been provided to the park or will be provided to the park within the next two years __ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park __ All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed

Activity Type:
Research

Subject/Discipline:
Soils

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):
Objective

The objective of this project is to determine whether spotted knapweed is less capable of invading the Big Meadow grassland because the phytotoxin catechin that is exuded by this invasive non-native species has less of an affect on resident native species at Big Meadow than in the Rocky Mountains region where this species dominates acres of grassland vegetation. Soil and seeds will be used

in greenhouse experiments using activated carbon to mediate effects of allelopathic chemicals. This experiment will test whether spotted knapweed is phytotoxic against resident natives in Big Meadow vs. grassland species from Montana.

Background

Spotted knapweed (Centaurea maculosa) is one of the most highly invasive species in the U.S. and has invaded extensive areas in the Rocky Mountains region. Bais et al. have shown that this species exudes a phytotoxic chemical from its roots referred to as (-)-catechin (Science 2003). However, this chemical is much less effective against knocking back competitors in its native range (Eurasia). The variation in efficacy of this chemical in knapweedâ s native vs. non-native ranges provided empirical evidence for the Novel Weapons Hypothesis and evidence that some plant communities are likely more tolerant of catechin and less susceptible to invasion by knapweed. Furthermore, production of oxalate by resident species in the Rocky Mountains helps them resist the phytotoxic effects associated with catechin (Weir et al. Planta 2005).

I have documented relatively low levels of invasion by spotted knapweed in Big Meadow, SNP relative in the in Rocky Mountain west. This may be explained by dispersal limitation, biotic resistance (negatively affected by resident competitors/enemies), and a number of other competing and nonmutually exclusive hypotheses. Here I propose to test whether resident species are more resistant to catechin relative to susceptible native species from Montana.

Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

Field surveys were done verifying that spotted knapweed has invaded Big Meadow. However, abundance of knapweed is not negatively correlated with species richness of natives. These findings correspond with predictions that the Novel Weapons Hypothesis relates to a portion of this species invaded range but not all areas.

Seeds of various species at Big Meadow were collected in 2006. We have conducted seed germination trials to determine which species will be used in upcoming greenhouse experiments. Greenhouse experiments are planned for 2007.

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?

No

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):	**Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):**
$0	$0

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year: